ROYAL GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

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CCCIV.—TAGASASTE.

(*Cytisus proliferus*, L. var. *palmensis*, Chr.)

Very full information respecting the useful fodder plant known in the Canary Islands as Tagasaste has been given in the *Kew Reports*, 1879, p. 18; 1880, p. 16; 1881, p. 13; 1882, p. 22 and in the *Kew Bulletin*, 1891, p. 239. This plant was brought into notice by the late Dr. Victor Perez of Orotava, Teneriffe, and it was entirely through the personal exertions of this estimable gentleman that so much information has been obtained respecting it and that seed of so useful a plant has been placed at the disposal of persons in various parts of the world for experimental purposes. Dr. Perez sent many supplies direct to Kew with results that have already been recorded. During a visit to Teneriffe in the early part of this year I had many opportunities of seeing the Tagasaste growing and of realising how valuable it proved in dry localities unsuited to the growth of any other kind of herbage plant. This note is to be regarded as supplementing in a few particulars the general information already given in the *Kew Bulletin*.

The ordinary *Cytisus proliferus*, Linn. f., or "Silky Cytisus" is a plant widely distributed in Teneriffe. It is known locally as "Escabon." It was observed growing plentifully at elevations of 3,000 to 6,000 feet. According to specimens in the Kew Herbarium it is found also in Grand Canary but probably to a much less extent than in Teneriffe. It is not infrequently seen as a cultivated plant in English greenhouses where its silky leaves and abundant white flowers render it a very attractive object. In Teneriffe it forms a large bush or tree with a stout woody stem sometimes attaining a height of 8 to 10 feet. The branches are of a slender drooping habit plentifully covered with ternate leaves on short petioles. The leaflets are oval-lanceolate pointed at both ends and clothed on the underside by copious silky adpressed hairs. These hairs are generally white but in some cases they are fulvous or even of a rich brown colour. The flowers (also silky in bud), are snow-white when fully expanded and attached in loosely-packed umbels on the sides of the branches. The pedicels are of a rosy colour. After flowering the bud in the centre of each umbel usually grows out into a branch—an appearance of proliferation which has suggested the specific name. The pods are slightly narrowed at the base and produced abundantly. They are sinuous, oblong pointed and densely pilose in the young state. This is the typical plant known as "Escabon" ordinarily met with in the mountainous parts in Teneriffe. There are several forms differing slightly in the size of the leaves and the colours of the flowers. None of them, however, possess

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any special merit as fodder plants. The Escabon itself is seldom browsed upon by animals unless pressed by hunger and it probably contains cytisine—an active poisonous principle known to exist in the common laburnum and other members of this genus. The tagasaste on the other hand evidently contains little Cytisine for it is readily eaten by animals and especially those that have become accustomed to it when young. The tagasaste is known in the wild state only from the island of Palma where it grew originally on the hills above the celebrated chapel of Our Lady de las Nieves at an elevation of about 1,000 feet above the level of the sea. It acquired considerable reputation locally and it was gradually distributed by cultivation all over Palma. The first person who carefully studied the tagasaste and wrote about it was Dr. Victor Perez. He introduced it into cultivation at Teneriffe and published a pamphlet on its merits as a fodder plant nearly 30 years ago. The plant was quoted in Dr. Victor Perez's writings simply as an unnamed variety of *Cytisus proliferus*. Although in botanical characters it differs only in a slight degree from the type it has nevertheless deserved to be regarded as a distinct variety and to bear a distinguishing name. The name that might very appropriately have been associated with it was that of Dr. Victor Perez. As the matter now stands, however, the tagasaste has been described by Dr. H. Christ in *Spicilegium Canariense* published in Engler's "Botanische Jahrbuches," IX. 120, as *Cytisus proliferus* var. *palmensis*. This name therefore distinguishes the Palma *Tagasaste* from the ordinary Teneriffe plant—*Escabon*.

Cytisus proliferus, Linn. f. var. *palmensis* differs from the type by its more robust growth and a laxer habit. It often attains a height of 12 to 15 feet in good soils and all parts of the stem and branches are enveloped in leaves. In fact its very leafy character is one of the marked features of the plant. The leaflets are ovate oblong, somewhat obtuse and dark-green in colour. The young growths, as may be seen in growing specimens at Kew, are almost entirely destitute of the silky hairs so abundant on the species. Dr. Christ's Palma specimens were obtained on the margin of woods above Barranco Carmen and at Dolores in March 1884.

It only remains to add a few words respecting the economic value and the uses of tagasaste for fodder purposes. Like all Canary plants it sends its very long tap roots deep into the ground, and it is thus enabled to bear prolonged periods of drought without injury. In many instances tagasaste was the only plant that throve in loose volcanic scoria and ash. Bushes of it more than 20 years old, existing under the most arid conditions, were still yielding regularly large crops of fodder. A plant or two is cultivated near every cottage in the neighbourhood of Orotava, and it is planted along the principal roads, to afford food for the animals kept by the road labourers. The tagasaste evidently prefers a loose friable soil, for then its roots can penetrate far into the earth. It grows moderately well also in somewhat clayey soils, but it is impatient of stagnant moisture. The climate where the tagasaste thrives best is mild and equable. The plant is well known not to bear frost, but on the other hand, it will probably bear considerable heat, and it might on this account be suited for most tropical and sub-tropical countries with a friable soil.

As already stated the tagasaste is readily eaten by domestic animals. Cattle, sheep, goats, and pigs evidently thrive upon it. It is said not to be so suitable for horses in the green state. This is practically the only drawback to its general use when freshly cut. It makes, however, an excellent hay, and as a dry fodder or after being treated in silos its

value is greatly increased. A sample of dried fermented tagasaste was forwarded to Kew by Dr. Perez through Her Majesty's Consul at Teneriffe in 1886. It is said that in this state tagasaste is particularly palatable to both horses and ruminants. Another interesting point about tagasaste is that its flowers are frequented by swarms of bees, and it has already proved at the Cape and in Australia of great value to bee-keepers. The late Dr. Schomburgk states that the tagasaste trees in the Botanic Garden at Adelaide "were covered with bees during the flowering "season."

In countries with bare hilly tracts denuded of forest tagasaste should prove of the utmost value. It requires no irrigation, and once it is planted it lasts for 20 years or more. When overgrown and cut down it yields excellent firewood. In very dry countries with light friable soils there is probably no plant that would so well repay cultivation as the tagasaste.

Further information may be obtained from the following publications: "De la Végétation aux iles Canaries," par le Dr. Victor Pérez et le Dr. p. Sagot, p. 12 (Extract du "Journal de l'Agriculture des pays Chauds," 1865–66); "El Tagasaste y su fermentación," por el Dr. Victor Pérez, Teneriffe, 1888; Report of the Botanic Garden, Adelaide, 1888, p. 5; "Le Tagasaste," fourrage important par Dr. Victor Pérez et Dr. P. Sagot publié sous la direction de Georges V. Pérez, Paris, 1892; "Cultures Tropicales," par Dr. P. Sagot et E. Raoul, Paris, 1893, p. 489.

D. M.

CCCV.—GREENHEART.

(*Nectandra Rodiœi*, Schomb.).

The Bibiru or Brown Greenheart tree of British Guiana (*Nectandra Rodiœi*, Schomburgk) is one of the most noted and valuable timber trees of Tropical America. It belongs to the natural order *Laurineæ*. According to Trimen, Miquel following Nees doubtfully refers it as a local variety to *Nectandra leucantha*, Nees, native of Brazil; but the figure he gives of that species ("Stirp. Surinam," t. 58), which is quoted by Meissner for *N. Rodiœi*, appears very unlike the Demerara Greenheart. The tree probably grows only in British Guiana, but is found abundantly there on rocky soils at a slight elevation in forests extending 20 to 100 miles inland from the coast. The tree often reaches a height of 60 to 80 feet with an erect trunk bare below and branched only at the summit. The bark is smooth, whitish-grey; the youngest branches are covered with a fine tomentum. The leaves are sub-opposite, on short peduncles, channelled above, about 6 inches long, oblong-oval, acuminate, entire, very shining above, rather paler beneath. The flowers are small, in axillary panicles. From the habit of growth of the tree the flowers are difficult to obtain. They possess a fragrant odour resembling jasmine. The fruit is roundish-ovoid, very blunt or sub-pyriform. The seed is solitary, very large, filling the fruit.

The only figure of this plant so far published is given by Bentley and Trimen (*Med. Plants*, t. 219). The bark of the greenheart possesses tonic and astringent properties, and it is known as Bebeeru, Biberu or Greenheart Bark. It has no marked odour, but its taste is strongly and persistently bitter and very astringent. From it is prepared sulphate of Beberia, a salt, if obtained, according to the directions of the British Pharmacopæia occurring as dark brown, thin, translucent scales, yellow when in powder with a strong bitter taste soluble in water and alcohol and entirely destructible by heat. As an astringent tonic in

general debility and chronic conditions of the alimentary mucous membrane it appears to be specially suitable (*Bentley* and *Trimen*).

Of other uses of this plant it may be mentioned that the Indians in time of scarcity use the seeds in the preparation of a kind of bread. The wood of the Greenheart is, however, most valuable. It is hard and durable and in demand for shipbuilding and other purposes. Its merits in resisting the attacks of the Teredo have lately been strikingly shown in some experiments undertaken in Port Said in connexion with the works of the Suez Canal. The correspondence on the subjects having been obligingly communicated to Kew by the Secretary of State for Foreign Affairs, it is published in the *Kew Bulletin* for the purpose of drawing further attention to the properties of this valuable timber tree.

FOREIGN OFFICE to ROYAL GARDENS, KEW.

SIR, Foreign Office, February 16, 1893.

I AM directed by the Secretary of State for Foreign Affairs to transmit to you, to be laid before Mr. Thiselton-Dyer, a despatch as marked in the margin relative to experiments made with regard to the resistance offered by woods to the borer worm.

I am, &c.

The Assistant Director, (Signed) E. GREY.
Royal Gardens, Kew.

BRITISH DIRECTORS, Suez Canal Company, to FOREIGN OFFICE.

MY LORD, Paris, 15th February 1893.

WE have the honour to transmit to your Lordship herewith a copy of a letter which has been received from the Suez Canal Company's chief engineer in Egypt as to some experiments which have been made at Port Said with regard to the resistance offered to the ravages of the borer worm (taret) by various kinds of wood.

Three piles of pine, oak, and greenheart respectively were placed in the arsenal basin at Port Said two years ago, and have recently been examined.

The result as shown on the sketch enclosed is that while the pine and the oak are almost entirely destroyed the Greenheart has suffered no injury whatever.

We have, &c.
(for the British directors)

The Most Honourable (Signed) H. AUSTIN LEE.
The Earl of Rosebery, K.G., &c.

ESSAIS DE BOIS DE GREENHEART.

Monsieur F. de LESSEPS, Président-Directeur de la Compagnie à Paris.

Ismailia le 24 Janvier 1893.

POUR faire suite à ma lettre No. 8831, en date du 26 Décembre 1891, j'ai l'honneur de vous informer que nous avons fait arracher les 3 pieux en sapin, en chêne et en bois de greenheart qui avaient été battus, le 15 Janvier 1891, à l'angle N.E. du bassin de l'Arsenal à Port-Saïd, a côté l'un de l'autre, pour que nous puissions nous rendre compte de la résistance comparative du bois de greenheart par rapport aux autres essences usitées.

Vous trouverez, ci-joint, un croquis de la forme et des dimensions de ces 3 pieux dans la partie immergée.

Il résulte de l'examen de ces pieux (qui avaient m. 0.250 d'equarrissage lorsqu'ils ont été battus) que.

1. Le pieu en greenheart ne porte aucune trace de tarets ou détérioration quelconque.

2. Le pieu en chêne est fortement attaqué par le taret dans toute la partie immergée et qu'il a pénétré assez profondément dans l'épaisseur du bois pour réduire la partie indemne à une section de m. 0.180 × m. 0.180 en A du croquis ci-joint et à m. 0.200 × m. 0.200 en B.

3. Le pieu en sapin est complètement rongé par le taret et se trouve hors de service. La partie indemne en A se réduit à une section de m. 0.070 × m. 0.070 et en B à m. 0.140 × m. 0.140.

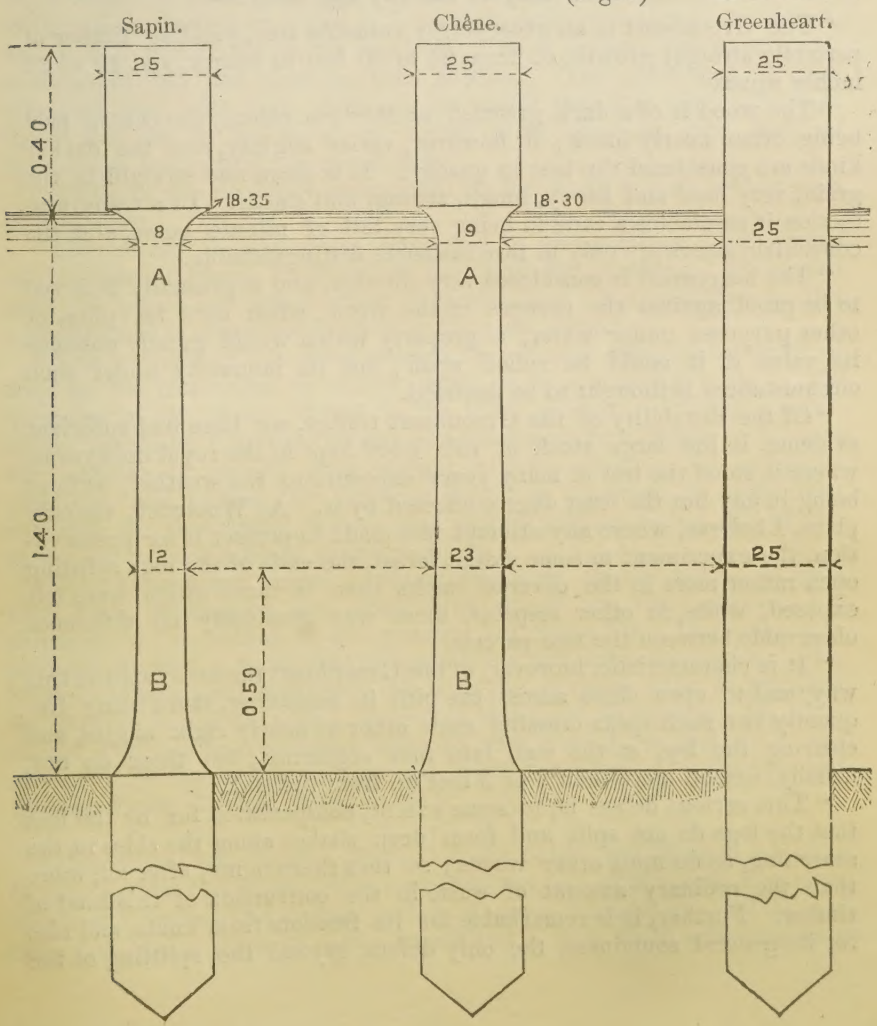
Ces essais ont donc démontré que le bois de greenheart offre une résistance aux tarets bien supérieure a celle du chêne et du sapin.

Pour déterminer dans quelle mesure nous aurions avantage à remplacer ces deux dernières essences par du bois de greenheart, pour la construction des ouvrages sous l'eau, il serait nécessaire que nous eussions la prix de revient du mètre cube de ce bois rendu franco à Port-Saïd, pour le comparer avec nos prix de revient des bois en chêne et de sapin.

Veuillez agréer, M.....

L'Ingénieur en chef de la compagnie,

(Signé) LEMASSON.



ROYAL GARDENS, KEW to FOREIGN OFFICE.

Royal Gardens, Kew,
February 22, 1893.

SIR,

I HAVE the honour to acknowledge the receipt of your letter of February 16, enclosing correspondence, herewith returned, with regard to the relative resistance offered by different kinds of wood to the ravages of the borer worm at Port Said.

The results are extremely interesting. The resistant properties of Greenheart were already well-known, but this is so striking and interesting an illustration that I propose to publish the correspondence in an early number of the *Kew Bulletin*.

The facts are of the more importance as the timber is the produce of one of our Colonies—British Guiana.

I am, &c.
(Signed) W. T. THISELTON-DYER.

Sir Edward Grey, Bart., M.P.,
Foreign Office, S.W.

The following detailed information respecting the characteristics and uses of Greenheart timber may be usefully appended:—

"The Greenheart is an exceedingly valuable tree, yielding timber of perfectly straight growth, of from 24 to 50 feet in length, and 12 to 24 inches square.

"The wood is of a dark greenish or chestnut colour, the centre part being often nearly black; it, however, varies slightly, and the darker kinds are considered the best in quality. It is clean and straight in the grain, very hard and heavy, tough, strong, and elastic. In a transverse section it resembles a cane in being very full of minute pores, and the concentric layers are only in rare instances distinguishable.

"The heartwood is considered very durable, and is generally believed to be proof against the ravages of the worm when used for piles, or other purposes under water, a property which would greatly enhance its value if it could be relied upon; but its immunity under such circumstances is thought to be doubtful.

"Of the durability of the Greenheart timber, we have had sufficient evidence in the large stock of this wood kept in the royal dockyards, where it stood the test of many years' exposure to the weather, without being in any but the least degree affected by it. At Woolwich, the only place, I believe, where any attempt was made to protect it for preservation, the experiment to some extent failed, the ends of the logs splitting open rather more in the covered stacks than in those which were left exposed, while, in other respects, there was absolutely no difference observable between the two parcels.

"It is characteristic, however, of the Greenheart timber to split in this way, and to open clean across the pith in seasoning, there being frequently two such splits crossing each other at nearly right angles, and cleaving the log, at the end, into four segments; but these do not, usually, extend more than 2 or 3 feet up from the end.

"This serious defect is, to some extent, compensated for by the fact that the logs do not split and form deep shakes along the sides in the seasoning, as do most other woods; so that there is not, after all, more than the ordinary amount of waste in the conversion of this kind of timber. Further, it is remarkable for its freedom from knots, and also for its general soundness, the only defect, beyond the splitting of the

ends before mentioned, being a cross fracture of the longitudinal fibres, which is occasionally seen, but can seldom be detected before the log is under conversion.

"The alburnum, or sap of this wood, is of a dark greenish colour, and differs so little in appearance from the heartwood, that it is often difficult to distinguish the one from the other. In quantity it is usually excessive, frequently amounting to a fifth, and sometimes even to a third, of the diameter of the tree. Few people, however, regard it when appropriating this timber to works of construction.

"Owing to the difficulty of distinguishing the sap, many either dispute its presence altogether, or assert that if it exists it may be safely employed the same as the sap of Lignum Vitæ; this is, however, by no means certain, as I have found that if it is placed in any damp or imperfectly ventilated situation, it decays much sooner than the heartwood; but if used under more favourable circumstances its durability is very great.

"In connexion with this question a merchant and importer of Greenheart timber said upon one occasion, when we had a parcel under survey, that he was confident a certain log had no sapwood upon it, for if it had, it would be liable to the attack of a small worm, but that the worm would not touch the heartwood. The log referred to was accordingly tested by cutting off a thin cross section, and upon examination of the piece, there were found in it several marks or traces of the worm, which had penetrated to the depth of 2 to 3 inches; the heartwood, or duramen, had not, however, been touched. The gentleman at once admitted that, with such evidence, he would take it as conclusive that there was sap to the depth of 3 inches on the log, but that its appearance had entirely deceived him.

"The case was no doubt exceptional, as the worm is very seldom seen in this wood.

"Greenheart is extensively employed in shipbuilding for keelsons, engine-bearers, beams, shelf-pieces, &c., and for planking. It is also used for piles, and many other purposes, but its application to the domestic arts is somewhat limited by its great weight.

"The strength of this wood exceeds that of most others, whether it be tried by the transverse or tensile strain, or by a crushing force in the direction of its fibres. Tried by the latter process, it exhibits a peculiarity unshared, I believe, by any other timber except Sabicu. It bears the addition of weight after weight without showing any signs of yielding; and, when the crushing force is obtained, it gives way suddenly and completely, with a loud report, nothing being left of the pieces but a loose mass of shapeless fibres.

"The Greenheart timber is not usually hewn in the perfect manner that Teak, Mahogany, and many other woods are when prepared for shipment to the markets of this country, but comes from Demerara only partially dressed, a great deal of wane being left upon the angles. The butts are also almost invariably left with the snapped ends, as prepared for drawing out of the forest, instead of being cut off square. Its form should therefore be considered with the price quoted per load, as it will not compare favourably with well-squared timber." — (*Timber and Timber Trees, Laslett*, 1875, p. 151).

"Greenheart (*Nectandra Rodiœi*) is the only wood shipped from the Colony, and it and Mora (*Mora excelsa*) are two of the eight first-class woods at Lloyd's. The average weight of *cured* Greenheart is 60 lbs. per cubic foot, and a piece 12 inches broad and 1 inch thick will support a

weight of 1,338 lbs. The average weight of Mora is 57 lbs. per cubic foot, and a piece 12 inches broad and 1 inch thick will support a weight of 966 lbs. In making these experiments the pieces of wood were supported at their ends. The specific gravity of Greenheart is 1.210, and of Mora 1.029.

* * * * * *

"When Greenheart was first exported from this Colony, one dollar per cubic foot was the usual price paid for the timber at the place of shipment; 28 cents. is the price paid at present for the same wood, but of inferior quality, the inferiority being due to the want of age and consequent want of durability.

"Greenheart does not grow over extensive tracts of country like Wallaba (*Eperua falcata*) and Bullet Tree (*Sapota Mulleri*), but seems to grow only near the rivers and creeks in a line inland from their banks of about two or three miles, and decreases in quantity as the rivers are ascended in the direction of the savannahs. In the clumps of trees that grow on the savannahs, and in the forest for many miles from its borders, I have never seen Greenheart growing. There is no Greenheart growing on the Cuyuni river above the Payuco Falls, two and one half days' journey from its mouth. Greenheart is used generally throughout the Colony in the construction of stellings, bridges, houses, boats, &c., &c., and in England for shipbuilding, dock-gates, piling, &c., &c. For all these purposes, when arrived at maturity, there can hardly be a better wood; but when young and sappy, it decays rapidly from the outside, and leaves a small core of durable wood, locally known as 'tacouba,' proportionate to the size of the original log. For proof of this see the piles of stellings and bridges.

"The Indian name of the tree is in the Arrawack Bibiroo: Accowois Rora-ék; and in the Carabisce and patois Dutch of the Essequebo, Sipiri.

"All the Greenheart cut in the Colony hitherto has been cut from the forests below or within a very short distance of the larger falls on the rivers, and owing to this limited space, the manner of conducting wood-cutting operations, and the cost of labour, combined, this tract of country is now being cut over in some places for the third time, and such trees as escaped observation or were thought too small to be cut previously, are now carefully sought for and cut down. The young saplings are cut down to make rollers on which to haul out the larger trees to water, and the seeds are collected and shipped to make Bibirine; thus, it seems to me, we are striving in the most expeditious manner possible to get rid of the Greenheart growing below the Falls." (*Mr. McTurk, before the Royal Agricultural Society British Guiana, 14th July* 1881.)

Nectandra Rodiœi, Schomb., the Greenheart tree. It is said there are three varieties of this, the Yellow, Black, and Mainop; they grow to tall trees in clay soil, and when near the rivers and creeks, attain large dimensions, yielding timber of a yellowish-brown colour, close in grain, very hard and heavy, the black variety being the heaviest. Greenheart is among the first-class woods at Lloyd's, and is an admirable timber for shipbuilding, engineering work, and for any purpose where great strength in scantlings is required. A fine log of Greenheart stood erect in the middle of the Court. This is now in the Timber Museum of the Royal Gardens, Kew. (*Colonial and Indian Exhibition*, 1886. *Reports, Timber, No.* 1, *p.* 451.)

CCCVI.—COFFEE ENTERPRISE IN THE EAST INDIES.

In a recent number of the *British North Borneo Herald* there appeared a short but interesting article on the history of the coffee industry in Ceylon from 1840 to 1870, and on the extraordinary development which has since taken place in that island in respect of tea cultivation. The favourable conditions which obtained in Ceylon in the early days of coffee planting are said by the writer to exist at the present time in British North Borneo, where the price of land is low, where freight charges are less than formerly, and where the present high price for coffee in European markets is likely to give rise to a flourishing industry :—

The present High Price of Land in Ceylon : the Coffee Enterprise in 1840 and in the future.

From the pages of the *Ceylon Times* we note a sale of Crown Land at Kandy on the 31st August of 244 acres at rupees 239 per acre or say, in round figures, 20*l.* per acre ; there was keen competition at the sale.

The editors of the *Ceylon Observer*, Messrs. A. M. & J. Ferguson, in the pages of their wonderful Directory of Ceylon have given a history of the planting enterprise in Ceylon which will well repay perusal, and they therein exhibit in telling figures the extraordinary energy of the Ceylon planter. Commencing in 1824 little advance was made in the coffee enterprise in Ceylon owing to differential duties in favour of coffee grown in the West Indies, which were removed in 1835. Free grants in the first instance were made to planters, but in 1833 an upset price of 5*s.* per acre was fixed and sales could only be made at auction. A deposit of 10 per cent. was paid at once and the rest within one year, Government defraying all costs of survey. The grants contained the usual reserves as to roads, precious metals, &c.

Between 1833 and 1844 the sale of Crown Lands at 5*s.* an acre upset price covered 2,693 lots, comprising 267,373 acres, which realised 142,758*l.*, or an average of 10*s.* 8*d.* per acre. During this period a very large number of estates were opened, and the immense crops obtained by the early planters, combined with the high price of 4*l.* per cwt., raised visions of untold wealth. Mention is made of an estate that gave 19½ cwts. per acre in the third year after it was planted, and Sir Emerson Tennant gives a graphic account of the wild rush into coffee in 1844–45 :—"The Governor and the Council, the military, "the judges, the clergy, and one-half the civil servants penetrated the "hills and became purchasers of Crown lands. The East India Com- "pany's officers crowded to Ceylon to invest their savings, and capita- "lists arrived from England by every packet." In 1847 the with- drawal of the distinctive duties that protected British plantations from competition with the coffee of Java and Brazil brought ruin to the planters of Ceylon, and parchment was sold in Kandy at about 15*s.* per cwt. (The price to-day is 95*s.* !) Since then coffee planting in Ceylon has been attended with alternate success and failure, culminating in, say, the year 1870, when Ceylon exported over 1,000,000 cwts. at the average value of 50*s.*, since when the price has touched 130*s.* per cwt., while the export of coffee has steadily fallen to about 90,000 cwts. per annum. This has been brought about by exhausted soil and leaf disease, which brought ruin to the coffee planter in Ceylon, and forced

him to turn his attention to other products; first to all, to cinchona, which at 10*s.* a pound for the bark seemed the planter's Eldorado, but so much was planted in the seventies that the export of bark from Ceylon rose from the round million pounds in 1880 to 11,000,000 in 1884, benefiting the world by enabling quinine to be sold at 1*s.* 6*d.* the ounce as compared with 12*s.* in 1880, but causing loss to the planters, who in some cases used the bark as firewood when the London price would not pay the freight. The old coffee lands and some of the cinchona lands have now been planted with tea in such quantity that the export has reached 70,000,000 lbs., and of a quality which has acquired world-wide fame, and the energy of the Ceylon planter has again achieved a hard and well-earned success. The price mentioned at the beginning of this article as lately paid in Ceylon for jungle land suitable for tea planting is not quite so high as the highest price paid in past years for coffee land, but it illustrates the value and the scarcity of suitable planting land in Ceylon. Some Ceylon men think the tea enterprise is becoming overdone, and would fain turn to their old love, coffee, but the difficulty in Ceylon is to find land suitable for coffee planting. The present high price of coffee and its likely continuance in the face of increasing consumption is bringing its cultivation prominently into favour, and the climate of the Malay Archipelago, which appears to be well suited to the coffee plant; and the success that is attending its cultivation, combined with the present high prices, is drawing attention to this part of the world's surface as a field for coffee planters. Free trade has done away with differential duties to some extent, and the coffee planter nowadays has little to fear from that source while attempting to supply the markets of the world with what has become such a necessary that its annual consumption has already reached the enormous amount of 850,000 tons, and is increasing, while prices are high and are rising. Here, in North Borneo, we can offer good land at prices similar to what were paid in Ceylon in the forties, and the planter will have less freight to pay, and can at present obtain a higher price for his coffee than the Ceylon planter of those days.

CCCVII.—PARASOL ANT.

The Parasol or leaf-cutting ant of Tropical America (*Œcodoma cephalotes*) is so destructive to cultivated plants that it has long been regarded as a serious pest. In the island of Trinidad an Ordinance has been passed known as "The Parasol Ants Ordinance 1890," for the purpose of eradicating the nests of these ants. As the ordinance is in some respects a new departure in regard to the destruction of an indigenous pest affecting cultivated plants, its provisions may be briefly noticed. The ordinance is permissive in its action, and provides that any person whose gardens or plantations suffer or are likely to suffer from the depredations of parasol ants may present a complaint to the warden of his district, who, after due inquiry, is empowered to give authority to the complainant to enter upon lands in his neighbourhood and destroy the ants' nests complained of. If the nests cannot be destroyed without injury to trees and growing crops, the complainant may be called upon to deposit a certain sum beforehand to compensate the owner and occupier of the land for any damage done. The ordinance, it will appear, provides for the destruction of the nests, not by the person on whose land they are found, but by the person who suffers

from the depredations of the ants issuing from such land. When the complainant has obtained the necessary authority, he may enter at any hour of the day or night upon neighbouring lands for the purpose of discovering or fixing the locality of the nests, and when discovered he may destroy such nests without let or hindrance. Anyone obstructing the action of the warden in going over lands suspected of containing ants' nests, or molesting or threatening to molest any duly authorised complainant or persons employed in the work of inspecting or destroying ants' nests, renders himself liable to a penalty of ten pounds or imprisonment for three months with or without hard labour.

Various methods have been recommended for destroying ants' nests. The following are suggested by Mr. J. H. Hart, F.L.S., in a recent number of the *Agricultural Record* :—

"The best method of killing the ants when their nests are in the ground is by the application of coal tar or gas water; if in walls or buildings, by sulphur fumes, or any other poisonous gases driven in by bellows or centrifugal fan. A very effective and useful machine termed the 'asphyxiator,' used for the latter purpose, can be seen at any time at the Royal Botanic Gardens. The method known as 'puddling' is effective, as it destroys the food of the nest as well as the insects themselves, and consequently there is no inducement for a new colony to take up the same abode, but gas water or gas tar is just as effective, if carefully and properly used. In fact there are as many ways of killing the Parasol ant as of building a house, and where failure results the numerous methods are not in fault, but the want of care in the application of them."

The action taken by the Legislature in regard to the destruction of the Parasol ant in Trinidad has drawn fresh attention to the habits of this species, and very interesting information has been published respecting it. The most accessible account hitherto existing was that written by Belt in *The Naturalist in Nicaragua*. The results of recent investigations have confirmed Belt in the supposition that the ants cut up the leaves of plants and bring the pieces into their nest to serve as a pabulum on which to grow a fungus. In fact these pieces are used to form an underground "mushroom bed" and the ants use the conidial stage of the fungus for purposes of food for themselves and their larvæ. The Hon. J. E. Tanner, Director of Public Works, Trinidad, has given interesting particulars of the habits of the Parasol ant in the *Journal of the Trinidad Field Naturalists Club*, No. 3, August 1892. Mr. Tanner had two nests on a table in his house. In one nest with a queen, the ants readily supplied themselves with pieces of leaves from plants placed near their feeding ground. Each forager dropped his portion of leaf in the nest and it was taken up by a small worker and carried to a clear space to be cleaned. It was then taken in hand by the large workers, who after licking it with their tongues, reduced it to a small black ball of pulp. These balls were built on to the edge of the already formed fungus bed and slightly smoothed down. The new surface was then planted with portions of the fungus brought from the older parts of the nest. "Each piece is planted separately and "the ants know exactly how far apart the plants should be. It some-"times looks as if the bits of fungus had been put in too scantily "in places, yet in about 40 hours (if the humidity has been properly "regulated) it is all evenly covered with a mantle as if of very fine "snow."

A further and somewhat fuller account of the habits of two species of Parasol ants, believed to exist in Trinidad, is given by Mr. J. H. Hart, F.L.S., in *the Agricultural Record*, November 1892.

Mr. Hart states that by one species the pieces of leaves are formed into a dome over the mouth of the nest and then taken inside when required.

Mr. Hart has taken a good deal of interest in the subject, more especially in endeavouring to determine the species of fungus cultivated in so interesting a manner by these ants. Several communications were addressed to Kew, but the material unfortunately did not arrive in a living condition, hence it was impossible to determine to what species the fungus belonged. Nevertheless this material, in addition to a well-prepared microscopic slide, communicated by the Hon. J. E. Tanner, has enabled Mr. Massee to recognise it as the conidial stage of *Rozites gongylophora*, Möller.

An exhaustive memoir on "The Mushroom Gardens of some South American Ants" has quite recently been published by Alfred Möller.* The thoroughness of this work is in some respect due to the fact that the author studied his subject on the spot. He made his observations in the province of Santa Catherina, Brazil, in the neighbourhood of Blumenau, where ants of various species abound. The statements made by Belt respecting the cutting up of leaves by ants for the formation of a pabulum on which a fungus was grown that served as food has been corroborated. The method of leaf cutting, the various species of plants used, and the formation of the "mushroom gardens" are given in detail, but the most interesting and hitherto unknown portion is that relating to the fungus cultivated by the ants in their "mushroom gardens." A series of cultures has proved this to be the mycelium and conidial stage of a fine agaric, which according to the Friesian system would belong to the sub-genus *Pholiota* of *Agaricus*, but which has been called by Möller *Rozites gongylophora*. The agaric grows in dense tufts, and has a purplish, scaly pileus, 10–16 cm. across. The highest form of the fungus does not occur normally in the "mushroom gardens," but only the mycelium and conidial forms, and it is the last-named conditions that are eaten by the ants.

Observations were made by Möller on the "mushroom gardens" of ants belonging to the following genera, *Atta* (*Acromyrmex*) Mayr. (*A. discigera*, Mayr.; *A. hystrix*, Latr.; and *A. coronata*, Fabr.); *Apterostigma*, Mayr., and *Cyphomyrmex*, Mayr.

Although Möller did not directly study the fungus cultivated by the Trinidad species (*Œcodoma cephalotes*) there is now little doubt that it is identical with that described by him as *Rozites gongylophora*, and hence a very interesting problem in botanical investigation has apparently been solved.

CCCVIII.—WORMWOOD AS A FODDER PLANT IN INDIA.

In a recent letter received from Mr. J. F. Duthie, F.L.S., the Director of the Botanical Department, Northern India, he refers to the sea-side wormwood (*Artemisia maritima*, L.), most abundant in the Western Himalayas. This plant is a much branched, decumbent, or nearly erect under-shrub belonging to the *Compositæ*, more or less covered

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* *Die Pilzgärten einiger südamerikanischer Ameisen*, 1893, (7 pl.). Jena, Gustav Fischer.

with close white cotton. It is found in sandy and muddy wastes, generally near the sea, and occupies large tracts of country bordering the Caspian and Black Seas. It extends round the Mediterranean to Western Europe, and, as already stated, it is found in the Westerm Himalayas. It is also abundant in Western Tibet in salt plains at elevations of about 9,000 to 14,000 feet.

Mr. Duthie finds that ponies feed upon this plant in the Himalayas "with relish," and he adds that "other species of *Artemisia* are "mentioned as affording good fodder for sheep on the Punjab "Himalaya." In localities where hardly any other vegetation exists, the use of the wormwood as a fodder-plant might prove of value. A bundle of dry leafy branches of *Artemisia maritima* was received at Kew from Mr. Duthie, and Professor A. H. Church, F.R.S., was good enough to undertake an analysis, in order to determine its nutritive properties. The results of Professor Church's investigations are contained in a memorandum reproduced below. It appears that the herbage of wormwood is not so valuable a food for horses and ponies as ordinary mixed grasses. It is, however, thrice as rich in albuminoids as the straw of European cereals, and to any animals not deterred from eating the plant by its somewhat sickly odour, it might prove under special circumstances, such as those which obtain in barren tracts and passes in the Western Himalayas, of considerable value.

Director of the Botanical Department, Northern India, to Royal Gardens, Kew.

Botanical Department, Northern India,
My dear Dyer, Saharunpur, 28th September 1892.

I am sending to your address to-day a parcel containing a bundle of *Artemisia maritima*, the most abundant plant on the hillsides about Gilgit. Ponies eat it apparently with relish, and other species of Artemisia are mentioned as affording good fodder for sheep on the Punjab Himalaya. It would be satisfactory to have some sort of analysis of this Gilgit species regarding its value as fodder. The demand for fodder of any kind along portions of the Gilgit route is at present very urgent, owing to the large number of baggage animals employed in carrying stores of all sorts to Gilgit.

I hope we shall soon have a chemical analyst for India, but in the meantime, if you could help to obtain for me the information required regarding the above-mentioned plant, I shall be very much obliged.

I am, &c.,
(Signed) J. F. Duthie.

Report by Professor A. H. Church, F.R.S.

Artemisia maritima, L.—Collected near Aster, North Kashmir, August, 1892.

I have submitted the sample to analysis, mixing the material together as uniformly as possible. The harsh woody texture of the plant and its powerful but sickly odour would not commend its use as the chief ingredient in horse fodder, but its chemical composition turns out more favourable than I expected. I think it is extremely probable that the aroma of this plant is chiefly due, like that of common wormwood, to *absinthol* ($C_{10}H_{16}O$) a liquid isomer of camphor. But a bitter

principle called *absinthin* ($C_{40}\,H_{58}\,O_9$), which is found in *Artemisia Absynthium*, has the smell of wormwood and may be present in the present plant; to separate and identify it would, however, require a large quantity of material.

Per-centage composition of *Artemisia maritima*.

Water	13·6
Oil, resin, wax, &c.	4·0
Starch, sugar, gum, &c. (by difference)	34·2
Albuminoids (true)	6·0
Fibre	33·9
Ash (includes 2·7 of sand and mica)	8·3

It should be mentioned that the 4 per cent. set down as "oil, resin, "wax, &c.," consists of the matters extracted by ether, of which it was found that three-fourths were soluble also in very strong alcohol, and were consequently for the most part resinoid and aromatic compounds. The albuminoids were determined by the phenol method: had they been calculated from the total nitrogen found they would have appeared higher (8·1 per cent.).

This plant contains rather less albuminoids, less digestible carbohydrates and more fibre than the average hay of mixed grasses. It is, however, thrice as rich in abuminoids as the straw of European cereals, which contain about 10 per cent. more fibre than this *Artemisia*.

(Signed) A. H. Church.

CCCIX.—COFFEE HUSKING IN LONDON.

The processes necessary for cleaning and curing coffee in tropical and sub-tropical countries entail a considerable outlay in buildings and machinery, and in many instances the produce is either shipped in an unsatisfactory condition or the industry is abandoned as beyond the means of small capitalists. The great difference that existed between "plantation" and "native coffee" in Ceylon years ago, and which now exists between "Blue Mountain" and "settlers'" coffee in Jamaica are believed to be closely connected with a proper system of curing the produce. Those with adequate means turn out good coffee, while the small cultivators with rude appliances can only turn out an indifferent quality. The prices obtained in the latter case are so low that large sums of money are annually lost owing to indifferent curing. This subject has for some years occupied attention in Jamaica, and it has been suggested that one means of improving the quality of the coffee raised by small growers would be to ship the produce to London after the pulp is removed and ensure that the subsequent processes are carried out on a large scale by efficient machinery in this country. The plan here suggested has already been successfully put into practice, and the results up to that time were given in the *Kew Bulletin* 1888, pp. 129–132. In a letter from Messrs. Lewis and Peat, dated 17th April 1888 (*ibid.* p. 132), they speak very hopefully of this plan of curing coffee:—"We beg to "inform you that the system of importing coffee in the parchment is "largely on the increase, and some most satisfactory results have been "obtained. We have recently sold large parcels from America which "were 'milled' here, and against 70*s.* per cwt. obtained last year for "the same coffee cleaned on the plantation we obtained 86*s.* per cwt.,

" although prices all round were lower. Experience shows that the " husk or parchment protects the bean from atmospheric influences " which affect the colour, and in every instance where trials have been " made the result has been in favour of cleaning here. The process is " quite simple, and the cost is 2*s.* 6*d.* per cwt., including everything. " The coffee must be pulped and the cherry got rid of on the plantation, " but the most important matter is the drying. It is absolutely neces- " sary that the parchment should be perfectly dried and kept from " moisture afterwards; insufficient drying is most damaging to after " results, and must have the greatest care."

The latest information respecting "husking" coffee in London is contained in the following correspondence addressed to Kew. The subject is of considerable importance to proprietors of coffee estates in the West Indies, and it is desirable to place such facts as bear upon it within their reach in a readily accessible form.

Mr. Mark B. F. Major to Royal Gardens, Kew.

Red Lion and Three Cranes Wharf,
Upper Thames Street, London, E.C.,
December 12, 1892.

Dear Sir,

When speaking to Mr. Haldane, of Messrs. Shand, Haldane, & Co., some little time ago, on the subject of coffee husking in London, he said he thought you would probably like to see a copy of the circular letter we drew up early in the year on the subject, and he kindly said I could mention his name. Knowing the great interest you take in all matters tending to promote the spread of accurate knowledge among growers, connected with the preparation of their produce, I have much pleasure in acting on his suggestion.

It was pointed out to my father, the late Mr. C. M. Major, about 1884, by a firm of coffee brokers in Mincing Lane, that as the business was already being carried on in Holland, it was a matter for important consideration whether it could not be established equally well over here, as otherwise there was a danger that coffee might be largely diverted from the London market when planters began to realise the convenience and benefit of the new method. As a result he approached Her Majesty's Customs, and was able to induce them to allow the husking of coffee to be carried on in bond, without undue restrictions, and he started the business in 1885, which has since become a considerable one.

The enclosed circular explains the most important points to be considered by planters, both as regards the preparation and advantages gained by shipping in the parchment. Should the subject prove sufficiently interesting to you, we should be pleased to show you over the husking warehouse, and explain the details of the process to you, and in that case you would no doubt arrange a day to call.

Believe me, &c.

(Signed) Mark B. F. Major.

D. Morris, Esq., F.L.S.,
Assistant Director,
Royal Gardens, Kew.

[Enclosure.]

Coffee Husking in London.

Red Lion and Three Cranes Wharf,
Upper Thames Street, London, E.C.,
March 1892.

Having been the first to erect machinery for husking coffee in London, and being frequently asked for a few particulars as to the treatment of the parchment, we venture to submit the following remarks to those of your friends who are interested in the question. At the outset we would mention that the operation is chiefly applicable to coffee treated by what is called in some countries the "West India Preparation," *i.e.*, to "washed" coffees, which are known by the trade here as "coloury." As these descriptions are most sought after by buyers, and command far higher prices than the qualities known as "unwashed," it is obvious that planters in their own interests should endeavour to market their crops in the former condition, the difference in price in a normal market being fully 20*s.* to 25*s.* per cwt. in its favour.

To obtain the best results, it is necessary that each operation, commencing with the gathering of the crop, should be performed with great care and discrimination. Only cherries of uniform ripeness should be plucked, as otherwise the pulping and most of the subsequent operations will be made difficult to perform, and the cleaned coffee will lack that uniformity of appearance and colour which is so highly prized by the buyers. The cherry coffee should be passed through the pulper (the machine for removing the pulp from the berries) as soon as possible after it is gathered, as the pulp is more easily removed before it has had sufficient time to dry and shrivel; care must be taken to see that the cherry pulp is thoroughly peeled from the berries, and as several of the latter will escape the action of the pulpers, sieves of a size which will allow only the free parchment coffee to pass through must be used, so that the cherries remaining in the sieves may be returned to the pulping machine. After pulping, the parchment coffee has to undergo a process of fermentation, and subsequently of washing in suitable tanks, when the adhering saccharine matter is got rid of; during this latter operation, it is of great importance that the parchment should be constantly stirred about, as by this means the light, black, and imperfect beans rise to the surface of the water, as well as sticks, leaves, and such like impurities, which should be skimmed off and treated separately. At no subsequent stage can this important object be attained in anything like so cheap and effective a manner, as the inferior beans can only be afterwards separated by hand-picking, a tedious and costly operation.

After washing, the parchment coffee has to be thoroughly dried, an operation requiring perhaps more knowledge of the article than any other, as on the way it is carried out depends to a very great extent the subsequent market value of the crop. If not sufficiently dried, the parchment becomes more or less musty in transit and the colour deteriorates, thus seriously affecting its selling value, and from the fact that the outer layer of coffee in the bags dries on the voyage to a greater extent than the bulk in the centre, it is impossible for us when we dry it here before husking to obtain an even result. In addition to this, freight and charges have to be paid on extra weight, which is an absolute loss; we may mention that many parcels we have received in a damp state have lost over 20 per cent. after drying, exclusive of the loss in weight naturally caused by the removal of the parchment. It

will thus be understood that it is imperative the parchment should be properly dried, especially as extra charges are incurred for drying here. On the other hand, care must be taken not to over-dry the coffee, as otherwise the colour will be impaired to some extent, which will reduce the market value; it is therefore apparent that the greatest care and experience is required to ascertain when the parchment is in really prime condition. After drying, coffee intended for husking in London has only to be shipped without further loss of time.

The advantages to be derived by planters in forwarding their coffee in parchment are several. The parchment covering acts as a great protection to the bean, while in transit, from all the deleterious influences to which it is necessarily subjected while in the close hold of steamers, on quays, &c., and above all it preserves the colour. This is probably one of the greatest advantages of any, as the finer the colour of the coffee, the higher is the price paid by buyers, and it has been abundantly proved that coffee husked here fetches prices higher by several shillings a hundredweight than the same coffee when cleaned abroad. Planters are also enabled to market their crop, probably several weeks earlier, than if they have to wait to husk it themselves. A material saving of labour is effected in districts where it is scarce, or where the crop is a heavy one, at a time when it is extremely important all hands should be concentrated on harvesting, and when this is complete, on the more careful cultivation of the plantation, thus increasing its powers of production, and at the same time getting the husking of the coffee done as cheaply as it could be effected on the estate. The outlay on machinery and other incidental expenses would be saved, and capital that would be locked up is set free; further, the dangers of a breakdown are avoided, a very serious matter on estates, where every important piece of machinery has to be obtained some thousands of miles away. Receiving as we do many thousand bags of parchment coffee each year, we have necessarily obtained considerable experience in the manipulation, and are enabled to work each parcel in the way best calculated to meet the requirements of the trade in all its different variations.

The total cost of receiving from import ship, landing, husking, sizing, and all the usual operations is 2*s.* 6*d.* per cwt., which we believe is at least as cheap as it can ordinarily be performed by planters, if not cheaper. The charge for drying is extra, and depends entirely on the condition of the parcel, but from what we have already stated, it is a charge which, in their own interests, planters should never incur here. The loss in weight from husking varies largely according to the nature of the parchment, and ranges from about 15 per cent. up to, in a few exceptional cases, about 22 per cent. The average loss is from about 18 per cent. to 20 per cent. The whole of the various operations are carried out in our bonded warehouses, under the immediate supervision of the officers of the Crown, which affords an important guarantee to importers that the correct weight is returned to them; no customs duty is charged by the Crown authorities on the husk.

We have occasionally received parcels of coffee, dried in the cherry, to husk, but we cannot recommend this mode of shipment, though it is possible that in a few individual cases planters might find it desirable to adopt it. In the first place, it adds unduly to the charge for freight, the coffee never turns out of such fine colour as it does if prepared as already detailed, and, of course, the loss in weight after removal of the cherry and parchment covering is much heavier, besides it is much more difficult to work, and necessitates a charge of at least 3*s.* 9*d.* per cwt. The foregoing remarks apply solely to coffee of the Arabian

sort. As regards Liberian coffee, we have no hesitation in advising, that unless absolutely compelled, shipments should never be made in cherry, as this species, even under favourable circumstances, is most difficult to work.

That the business has developed so largely since we commenced operations in 1884, appears to us conclusive proof that many planters are fully alive to the benefits to be derived by the adoption of this method for marketing their crops, and we therefore trust these remarks may be of special interest to those who are at present unaware of the facilities to be now obtained in London, and who have not suitable machinery on their estates for cleaning the coffee themselves.

(Signed) MAJOR & FIELD.

The following correspondence relating to the same subject is taken from the *Jamaica Post* of the 15th May 1893.

TO THE EDITOR OF THE "JAMAICA POST."

SIR,

IN response to an appeal from the Clarendon Agricultural Society, the board of the institute appointed a committee to visit the show recently held at May Pen.

As a result of their visit, the committee recommended that a special prize of two guineas be awarded to Mr. J. L. Hibbert for his exhibit of coffee for export in parchment, and the committee stated, that "they "wished by their award to point out to small settlers, how desirable it is "to export coffee in this manner, as it does away with the expense of "milling, and saves both time and trouble. In Central America, the "owners of large plantations have given up the use of expensive milling "machinery, because they find that it pays them better to export coffee in "parchment, and it is hoped that merchants and buyers of coffee in this "island will give their attention to the question of the purchase of it in "this form."

This prize was accordingly awarded by the board. As, however, their attention was drawn to a statement made by the Clarendon agricultural authorities, that there appeared to be some difference of opinion as to the advisability of the exportation, by settlers, of coffee in parchment, the board decided to invite the opinion of experts, and I am desired by them to ask you to be good enough to give publicity to the following report kindly supplied by Messrs. Park, MacFadyen and Co., which will, they think, prove of interest to all engaged in coffee planting.

I am, &c.

(Signed) FRANK CUNDALL, Secretary.

Institute of Jamaica, May 12th, 1893.

[Enclosure.]

REPORT from Messrs. PARK, MACFADYEN & CO.

COFFEE HUSKING IN LONDON.

At the outset we would mention that the operation is chiefly applicable to coffee treated by what is called in some countries the "West Indian Preparation," *i.e.*, to "washed" coffees, which are known by the trade here as "colory," and as these descriptions are most sought after

by buyers, and command far higher prices than the qualities known as "unwashed," it is obvious that the planters in their own interests should endeavour to market their crops in the former condition. It sending over parchment coffee, great care should be taken to have it thoroughly dried before shipment, as to a very great extent, this affects the market value. If not sufficiently dried, the parchment becomes more or less musty in transit, and colour deteriorates, thus seriously affecting its selling value, and from the fact that the outer layer of coffee in the bags dries on the voyage to a greater extent than the bulk in the centre, it is impossible for us when we dry it here before husking to obtain an even result. In addition to this, freight and charges have to be paid on extra weight, which is an absolute loss ; and we may mention, that we have received parcels in a damp state, which show a loss of 20 per cent. after drying, exclusive of the loss in weight naturally caused by the removal of the parchment. It will thus be seen that the parchment should be dried thoroughly, especially as extra charges are incurred for drying here. On the other hand, care must be taken not to overdry the coffee, as that impairs the colour to some extent. The advantages to be derived by planters in forwarding their coffee in parchment are several. The parchment covering acts as a great protection to the bean while in transit, from all the deleterious influences to which it is necessarily subjected while in the close hold of steamers, on quays, &c.; and, above all, it preserves the colour. This is probably the most important of all, as the finer the colour of the coffee, the higher is the price paid by buyers; and it has been abundantly proved that coffee husked here, fetches prices higher by several shillings a hundredweight than the same coffee when cleaned abroad. Planters are also enabled to market their crop probably several weeks earlier, than if they did it themselves, and a material saving of labour is effected in districts where it is scarce.

CCCX.—CANARY ROSEWOODS.

(*Convolvulus floridus*, L. *Convolvulus scoparius*, L.)

One of the most interesting and striking plants in the Canaries is a shrubby convolvulus, known locally as *Guadil*. This was in flower in the neighbourhood of Orotova in the month of March last. It appears to be little known under cultivation in European gardens, although a single specimen exists in the collection of Mr. Thomas Hanbury, F.L.S., at La Mortola. This, together with a closely allied species to be presently described, is sometimes known as rose-root, and is said to yield oil of roses. The Guadil (*Convolvulus floridus*, L.) is, however, more interesting as an ornamental flowering shrub than for any economic purposes to which, at one time, it may have been applied. It belongs, as already mentioned, to the Bind-weed order (*Convolvulaceæ*), although nothing can be less like a convolvulus in habit, and is one of the comparatively few examples of this order (containing the jalap plant, the sweet potato, the scammony, and the showy ipomæas) possessing an upright stem and a tree-like habit. It may be described as a compact shrub from four to six feet in height, with a stout woody stem and numerous branches. The branches, especially in the young state, are white powdered, as also are the abundant linear undulate leaves. The

latter are about three or four inches long, attenuated towards the petiole with rounded and somewhat emarginate tips. The flowers are abundantly produced in large loose terminal panicles. The sepals are ovate acuminate about two lines long. The corolla is about one-half to three-quarters of an inch in diameter, and pure white. The capsule is conical, and slightly villose at the apex. It is somewhat remarkable that so striking a plant has been figured but once, and that nearly one hundred years ago.

In Jacquin's *Icones Plantarum Rariorum*, t. 34, there is a long branch shown with the leaves clustered together at the apex and a few large flowers. This is scarcely characteristic of the habit of the plant, and the flowers are too large. When in flower the plant appears as if covered with newly fallen snow. It is one of the few native plants which awakens the enthusiasm of local residents at Teneriffe. As in other parts of the world these usually strive to grow unsuitable introduced plants and to neglect the many beautiful objects so well adapted to their soil and climate. According to Dr. Perez the *Gaudil* was an object of high regard by the Guanches, the aboriginal race of the island. This can well be understood, for when in flower it is one of the brightest and most attractive objects in the Teneriffe landscape. The pale powdered green of the leaves forms an excellent background for the masses of pure white flowers. The only pity is it is so rarely seen. In the search for rose-roots for export purposes this and the allied species have been nearly exterminated in the wild state. In Teneriffe it grows from sea level up to elevations of about 1,000 feet. It evidently prefers a free porous soil and thrives in exposed situations on rocks and slopes. A fine plant was growing on a stony mound at the farm belonging to Dr. George Perez near Puerto Orotava, and another was seen at the Botanic Garden near the same place. In rich soil the plant appears to put on a looser habit, and when laden with flowers the panicles become almost pendulous. In this country the plant would require the protection of a greenhouse and plenty of exposure to sun and air. During the winter, when in a dormant condition, it would be necessary to keep it rather dry. It is readily increased by seed, and as it is a fast grower it should flower in the second or third year.

Dr. Christ has published (in his *Spicilegium Canariense* in Engler's *Botanische Jahrbücher* IX. p. 125), a description of a new variety of this plant—*Convolvulus floridus*, var. *densiflorus*. The variety is distinguished by a more compact habit, shorter and broader leaves crowded near the ends of the branches, by a shorter panicle, and by much more numerous but smaller flowers. The variety was found near Ponta de Teno, Teneriffe, by Hillebrand. For cultivation in greenhouses in this country the variety with a compacter habit and more abundant flowers may prove a very desirable plant.

The other species included in this note is the plant more correctly known as rose-root, *Lignum rhodium* or rose-wood (*Convolvulus scoparius*). This, as its name denotes, is a convolvulus with the habit of the common broom. It is an erect shrub seven to eight feet high, with a few long narrow branches and somewhat short linear leaves. The flowers are produced in many flowered axillary cymes. The corolla is slightly plaited with a five-partite limb; it is tinged with red outside and white within. This is known locally as *Leña Noel* or *Leña Loel*. It is only rarely met with; Teneriffe specimens in the Kew Herbarium are from Guia on the South-western slopes of the island and from Barranco Santo. It is said to be more common at Palma, but owing to the excessive digging of the roots many years ago,

for export purposes it is restricted to very few localities. There are several good figures of this plant. One of the best is that given in the "Botanical Register," 1841, t. 43, with a description by Dr. Lindley. This was from a plant grown at Milford near Godalming sent by Mr. Barker Webb.

There is a single specimen of the root of *Convolvulus scoparius* in the Kew Museum. It is about eight inches long, two and a half inches wide and one inch thick. The heartwood occupies about three-fourths of the entire diameter of the specimen, and is of a distinct orange yellow colour, very dense, marked by closely-lying annual rings and numerous, very fine medullary rays, the spaces between them being filled with small, partially open vessels. The sap wood is very much lighter in colour, and is comparatively soft and easily cut. It was sent to the Museum by P. Barker Webb about 1850, and still retains its rose-like smell. A sample labelled *Oil of Rhodium* is also in the Kew Museum, where it has been at least 35 years and probably longer. Sir William Hooker, in his first edition of the "Kew Museum Guide" published in 1855, mentions a sample of oil in the Museum at that period which is probably identical with that now existing. It is of a clear amber colour and possesses a distinct though not a penetrating odour of roses.

In Lindley's *Flora Medica* (1838), p. 400, there is the following note on this plant:—

"Wood perfumed, smelling strongly of roses, yellowish fawn colour veined with red, burning readily when lighted. Taste bitter, balsamic. Yields by distillation an essential oil of bitter balsamic flavour; little used, except, according to Feé, for adulterating oil of roses."

Appended to the description of *Convolvulus scoparius* in Edward's *Botanical Register* (1841), t. 43, Dr. Lindley states:—

"At all events this is the plant that yields *Lignum rhodium*, a wood smelling strongly of roses, yielding by distillation a bitter oil, and employed by perfumers for adulterating or altering oil of roses. The roots, which accompany the stems, as they are imported, are said to be much stronger scented than the stems. The old writers on drugs, misled by the name, imagined that this product must come from *Rhodes*, translating the name Rhodeswood, and after hunting in vain in the writings of either ancients or moderns for the plant that yields it, arriving at the erroneous conclusion that it was the Aspalath of the Greeks. It is, however, certain that the name really signifies wood smelling of roses. Oil of Rhodium is the name given to the oil obtained from this plant. The wood when powdered has been recommended to promote sneezing, and forms an agreeable snuff. It is valued for fumigation, and when burned diffuses a most delightful fragrance."

Mr. Barker Webb, in a note (*Bot. Reg.* (1841), App. p. 70) remarks:—

"The roots of both the original species (*Convolvulus floridus* and *C. scoparius*) are fragrant, and yield the so-called Oil of Rhodium by simple distillation, though the first in a less degree, or sometimes, when young, scarcely any. The original *lignum rhodium* which came from Macedonia was certainly Linnæus's *Rhodiola rosea* figured as such by Parkinson in his *Theatrum Botanicum*, after Lobel. 'It grows,' he says, 'in the very raggiest places on the mountains of 'Pangle and Ingleborough.' Soon after the discovery of the Canaries this name was transferred to *Convolvulus scoparius*, and afterwards to several American plants. It is called in the Islands Leña Noël, a corruption of Lignum aloes, and though now in little request, large quantities of it were formerly exported and the plant nearly extirpated."

The latest information on the subject is probably contained in Piesse's *The Art of Perfumery* (1879) p. 188, as follows:—

"When rose-wood, the lignum of the *Convolvulus scoparius*, is distilled, a sweet-smelling oil is procured resembling in some slight degree the fragrance of the rose, and hence its name. At one time, that is, prior to the cultivation of the rose-leaf geranium, the distillates from rose-wood and from the root of the *Genista canariensis* (Canary rose-wood) were principally drawn for the adulteration of real otto of roses; but as the geranium oil answers so much better, the oil of rhodium has fallen into disuse, hence its comparative scarcity in the market at the present day, though our grandfathers knew it well. One cwt. of wood yields about three ounces of oil.

"Ground rose-wood is valuable as a basis in the manufacture of sachet powders for perfuming the wardrobe."

D. M.

CCCXI.—CACAO-GROWING IN GRENADA.

(*Theobroma Cacao*, L.)

Cacao-growing is the staple industry of the interesting island of Grenada, and its prosperity during many years, when the other islands in the West Indies were in a depressed condition, was mainly due to the successful cultivation of Cacao trees. The maintenance of this industry is therefore a matter of great local concern. The present Governor-in-Chief of the Windward Islands, Sir Walter Hely-Hutchinson, K.C.M.G., has fully realised this fact, and he has been most strenuous in his efforts to assist cultivation, and to encourage everything calculated to improve the productiveness of the cacao estates.

The Botanical Station established at Grenada has also been brought into a vigorous state of efficiency, and it is now one of the most useful of any. This institution issues regularly a *Bulletin of Miscellaneous Information*, and in a recent number there are discussed several interesting points connected with the cultivation of Cacao trees gathered from the experience of a proprietor who has been more than ordinarily successful in producing large crops from a small area.

After referring to the little attention hitherto paid in the island generally to draining, manuring, and pruning on Cacao estates, Mr. G. W. Smith, the intelligent curator of the Grenada Botanical Station, proceeds as follows:—

"It is pleasant to notice one of the few instances in our island of a Cacao estate where, as the result of a careful system of draining and manuring, the proprietor gets from only twelve acres of Cacao a return equal to what many others receive from three times that quantity. I refer to Good Hope Estate in this island, owned by the Rev. G. W. Branch. On the advice of his Excellency Sir Walter Hely-Hutchinson, I called one morning on the proprietor, and was most courteously shown over the whole plantation. Both Mr. Branch and his son, Mr. George Branch, most willingly afforded me all the information in their power. Wishing to be as clear as possible, I shall endeavour to adhere as closely as I can to Mr. Branch's replies to my questions concerning the working of his estate.

"'I have been owner of the property for over 20 years. Good Hope contains 22 acres—eight acres of this are in canes and pasture. I estimate that the buildings, yard, and entrance occupy another two acres, so that my extent of Cacao cultivation cannot be much over 12 acres.

I purchased the place for about 100*l.*; at that time it had a few neglected Cacao trees here and there. Many people ridiculed my attempt to grow Cacao there, as the land was considered by most persons as almost valueless for that purpose. However, be that as it may, I could easily borrow 2,000*l.* to-day on its security if I wished to do so. My soil is rather poor for Cacao when compared with many other places; as you will see, in many places there is a bed of "tuff" not far from the surface, and you know, when the tap root of a Cacao tree touches this, there is an end of the whole matter.'

"'How, then, do you account for the flourishing state of your trees, when, to judge from their size, the tap roots must long since have come into contact with this layer of "tuff"?'

"'My Cacao trees have no need to drive their tap roots very deep, as I will show you when we are going through the orchard. The Cacao tree is naturally a deep rooter, but if it can meet with its nourishment near to the surface it will most undoubtedly develop its feeding spongioles wherever that nourishment is, and that is what happens in the case of my trees.'

"'Please explain how you do this?'

"'Willingly. My Cacao orchards are, as you observe, on the slope of a hill. Skirting the sides, therefore, among the trees, I have roads cut by simply digging down the slope to a level. These roads are sufficiently wide to admit the passage of a light donkey cart, and as they wind along the hillside in a corkscrew fashion you will understand how they serve a two-fold capacity. First, they act as roads proper, and, secondly, they act as drains, since a small canal always skirts the upper edge for the whole of their length. Thus I have my Cacao field drained at regular intervals, and, in addition, my donkey cart can carry manure to any part of my estate'

"'How do you apply your manure?'

"'Very simply; I just have the cart filled, and the driver upsets it at regular distances over the lower edge of these roads. I then go round as I can find time and bury this in. I likewise collect all leaves and bush from time to time, and bury these also. You will now see the effects of my system. Look down on the ground; what you are walking on is not pure earth. Take up a handful of it! You will notice that it is a dense mass of fine rootlets or spongioles! These have been called into being from the amount of nourishing material which they find here ready for them, and have no need to go deep in search of food.

"'My system has converted the trees into surface feeders, and provided I keep them supplied with food I can fairly be said to have them well under control. Now, without manure the case is different; the tree has to push its tap-root deeper and deeper every year in search of food; often it strikes "tuff" or "clay," then death ensues. Even when this does not happen, it stands to reason that a tree with a single tap-root supplied with a few scanty and half-starved side rootlets, is in a poor way when compared with my healthy and vigorous trees which have an abundance of young roots all eagerly sucking up the plant food around them. The good effect of this is easily seen when comparing the returns I get with those of neighbouring planters.'

"'What do you average as a return from your 12 acres of Cacao cultivation?'

"'About 87 bags per annum. This would represent a trifle over seven bags to the acre.'

"'The old trees which you found on the place 22 years ago must be very old by this time; do they still bear vigorously?'

" ' Yes, quite as well as the young ones, and they seem good for many years yet, thanks to my manure system.'

" ' What do you consider to be a good yield per tree in pods per annum ? '

" ' It would be difficult for me to answer this, and, indeed, I have never kept a record ; my trees practically never stop bearing, but my son counted 205 ripe pods on one of the trees besides green fruit and flowers ; as you can see most of them have each several dozen ripe fruit, green fruit, and flowers on them at the same time, so that my crop may be said to be continuous.'

" ' Do you purpose extending your cultivation ? '

" ' No ; the remaining portion of my land is too much swept by prevailing winds to be of any value for Cacao ; besides, I find that it pays me better to keep a portion in cane cultivation or some other fodder, not for the profit to be derived from sugar, but because it enables me to feed my stock ; without this I could get no manure, and without manure I could get no Cacao. I look upon my stock, therefore, as part of my working capital, but people here seem entirely to forget this. I very often hear people speaking of the hard work they are having to get their plantation "covered in" as they call it, but if they knew what I know, they would find it more to their interest to keep one-fifth of their plantation in pasture lands, and fields of fodder plants, and to keep several head of stock to fertilise the other four-fifths.'

" ' What system do you adopt in storing your manure ? '

" ' The old Barbados system, which I have found to work so well. I have all my animals kept in a pen, a portion of which is covered to afford protection in heavy weather. In this pen they stay nearly all the time that they are not in use. Their excrement is consequently collected in one place. I regularly cover this over with cut bush and litter, and at intervals I spread a layer of mould over it, and re-cover with litter. The result is, that at the end of a few months I have a mass five feet thick of the richest fertilising material that I know of and one that for our generous soil needs little assistance from chemical manures. In addition to this I use a large quantity of sheep manure, which I collect in a similar manner from my sheep farm at Point Saline.'

" ' Do you ever transplant your trees ? '

" ' Often ; and here, again, the beneficial effects of my system becomes apparent. I take up large trees with pods on them. There is no danger, not being deep feeders they give little trouble. When a gap occurs through the death of a tree I fill it up as soon as possible.'

" ' What do you do in the way of pruning ? '

" ' I go through regularly and often, and break off all young shoots, and cut out any dead wood. You will see that my trees are perfectly clean of vines and lichens. A tree can't be healthy that has the pores of its bark stopped with roots of parasitical plants.'

" ' What is your opinion about shade ? '

" ' I find in my locality that shade is beneficial in the growing stage, but is inimical when the tree commences bearing, at least heavy shade is. This holds good with even the " Criollo " Cacao, of which, as you see, I have a large number. With me this is one of the hardiest varieties, and bears profusely. My trees have crossed with each other, and now I have a great number of varieties shading off one into the other.'

" ' Do you use any care in selecting seed ? '

" ' At first I was anxious to get my land planted up, so raised whatever seed I could get. Now I select and replace a bad variety with a good one whenever opportunity offers.'

" ' Do you grow other products with your young Cacao ? '

" ' Always ; such crops as yams, tannias, cassava, and canes come well with young Cacao, and, in my opinion, rather do it good than otherwise, besides yielding catch crops of considerable value.'

" ' What process do you adopt in picking and curing. Do you separate the different varieties before sweating ? '

" ' With a small cultivation like mine it would be difficult to get a sufficient quantity of Criollo or any other variety at any one time to set up separate sweating boxes. I see the advantages of it, and regret that I cannot do so. My last account sales, however, are very satisfactory, and show a receipt of 72*s*. per cwt., which, taking all things into consideration, is very fair indeed. The process of curing is that generally pursued in Grenada, and needs no special explanation.' "

CCCXII.—GAMBIER IN BRITISH NORTH BORNEO.

A full account of the Gambier plant and the preparation of commercial Gambier, used for tanning purposes, was given in the *Kew Bulletin*, 1889, pp. 247–53. Since that time an attempt has been made to establish the cultivation of Gambier to British North Borneo. Information respecting the progress of the plantations in that part of the world is given in the *Kew Bulletin*, 1893, pp. 76 and 243. In the following correspondence an account is given of the first samples of Gambier received in this country from British North Borneo :—

The British North Borneo Company to Royal Gardens, Kew.

15, Leadenhall Street, E.C.,
2nd February, 1893.

Dear Sir,

I have much pleasure in forwarding for your information copy of a report on our first specimen of Gambier from British North Borneo.

I observed that you printed some information as to our Experimental Gambier Garden, in the October number of the *Kew Bulletin*, and it is possible you may think it worth while to follow it up with this analysis.

Yours faithfully,
(Signed) William M. Crocker,
Manager.

W. T. Thiselton-Dyer, Esq., C.M.G.,
Royal Gardens, Kew.

[Enclosure.]

4, Fenchurch Avenue,
27th January, 1893.

Dear Sir,

We beg to advise you that we have had your sample of cubes analysed by Messrs. G. H. Ogston & Moore, and we are happy to inform you that, in spite of your sample being very mouldy and dirty by improper packing, the result of the test is eminently satisfactory.

In its present moist condition it shows 19·86 per cent. of tannin, but when properly dried and prepared as we should expect it to be delivered when shipped in the ordinary way, the test shows as much as 27·85 of tannin.

To show the importance and value of this result we have obtained from the above gentlemen a further analysis upon a fair sample of No. 1

Rhio Cubes; such is at present selling on this market at 30*s.* per cwt., and the following is the result, viz. :—

1st Test (wet).

	No. 1 Borneo Sample.	No. 1 Rhio Sample.
Tannin - - -	19·86 per cent.	20·00 per cent.
Moisture - -	18·70 „	13·92 „
	2nd Test (dried).	
Tannin - - -	27·85 per cent.	23·23 per cent.

which proves conclusively that on the ground of strength the Borneo sample is all that could be desired.

The objection to your sample is that in point of colour and general make up it is only suitable for shipment as ordinary "block," the value of which is from 19*l.* to 19*l.* 10*s.* per ton. If, however, you can produce pale cubes equal to the samples herewith the value would be much higher, as the following will show—

	£	£	*s.*
No. 1 sample block, value - - - -	19	19	10
„ 2 „ cubes „ - - -	31	32	0
„ 3 „ „ dark, value - - -	30	31	0

Bale Gambier is always pressed packed in double mats or gunnies, and should weigh from 2 to 2½ or even 3 cwt. each. Cubes should be well dried before shipment in order to prevent being "caked" or "blocky" on arrival, and are packed in bags weighing 1½ cwt. to 1¾ cwt. per bag.

The present rate of freight from Singapore to London is 22*s.* 6*d.* per 20 cwt. for block, 20*s.* per 10 cwt. for cubes.

There would be no difficulty in selling any quantity of the above all the year round.

We are, &c.
(Signed) Huttenbach & Co.

Mr. H. Walker to Royal Gardens, Kew.

My Dear Sir, Sandakan, 21st April 1893.

I enclose report and analysis of Gambier raised in the Government Experimental Garden in Sandakan, which I am sure will be of much interest to you.

I took charge of the garden on the 3rd October, 1891, after my return to North Borneo, when 200 Gambier plants and 100 pepper cuttings had just been planted ; by the 25th October I had 990 Gambier plants out, and by the 8th December I increased the number to 3,253 and 587 pepper plants.

On the 4th October 1892, I decided to cut the first plantings, and we commenced boiling some time before the 2nd November and continued into December, and obtained five piculs of Gambier, but the colour was spoilt by the new iron boilers and by the smoke in my rather limited boiling-house. Consequently I had to ship it as Block Gambier.

The first sample was taken without my knowledge by an energetic friend, who gave me a copy of the analysis. The second report is on my sample parcel. The garden has now been taken over by a Chinaman, who is increasing it. He will cut over the whole clearing in May,

and expects to get from 15 to 20 piculs. The plants I cut are now well-grown, and ready to cut again.

Up to the present only Chinese have taken up the cultivation of Gambier, but I can confidently assert that Europeans will do it better and get a higher price. What the trade wants is an assurance of quality and a sufficient quantity of a similar quality. I think it would be well to sell it per unit of Tannin, as Cinchona bark is sold. With a guarantee as to moisture, &c., and if copper pans and properly constructed drying-houses be used, the colour would (need) never vary.

The pepper plants are doing well. I am glad to tell you our *Coffea liberica* is doing very well. About 330 acres were planted by Europeans last year, and I believe a similar acreage will be this year. The reports all round are very favourable, and 12 months plants are now blossoming. Our climate, with its well-divided rainfall, seems particularly well suited to Liberian Coffee, and I never saw anything like it in Ceylon for vigour of growth or size of stem.

Cocoa is doing well here, and has a remarkable stem, but it is only since my return in 1891 that any plantings of coffee, &c. (of any size) have been made by Europeans, so that we do not figure on the markets. That we shall do so I have no doubt; indeed, I expect this will be a great coffee country. The latest reports from the tobacco estates are all favourable.

I am, &c.
(Signed) Henry Walker.

[Enclosure.]

Singapore, 25th March, 1893.

Messrs. Huttenbach Brothers & Co.'s report on 17 small bags pressed into 4 bales Block Gambier, marked B. N. B. D. C. L. $\frac{1}{4}$ London weighing Piculs 4·78, cwts. 5, qrs. 2, lbs. 2, shipped per S.S. "Pelamon" on 25th March :—

"The quality, we are pleased to say, is pronounced by local buyers "to be good, and not inferior in any way to Singapore Gambier, and "we have been offered for this parcel $7 per picul, while the market "price was only $6·60."

"However, the higher price is explained by the unusual dryness of "the goods, which of course enhances its value."

In another letter to Mr. Pryer, Messrs. Huttenbach Brothers & Co. say "the Gambier you sent is, if compared with the Singapore Gambier. "a little too dark coloured and too dry, but you will no doubt be able "to improve the next production in these respects."

CCCXIII.—WEICHER'S FIBRE EXTRACTING MACHINE.

This fibre extracting machine is constructed by J. J. Weicher, 108, Liberty Street, New York. It is now on trial in this country under Mr. Weicher's supervision at the Carlton Works, Printing House Yard. Hackney Road, London, N.E. The chief interest at the present moment attached to fibre machines is based on their capability to clean leaves of the Sisal Hemp plant so largely planted at the Bahamas and

elsewhere. This brief report is therefore almost entirely confined to the treatment of leaves of this sort.

Recently, accompanied by Sir Alfred Moloney, Governor of British Honduras, I accepted an invitation to see the Weicher machine at work on Agave leaves obtained from the Riviera. The leaves were those of *Agave americana*. They had been cut about a fortnight, and hence they were not in the best possible condition for being experimented upon.

The Machine.—The machine consists of a drum fitted with beaters, and a feeding table mounted on an iron frame about 14½ feet long and 2½ feet wide. The whole structure is of iron, fitted with beaters composed of a mixture of copper, aluminium and iron attached to the drum where it comes in contact with the juice of the leaves. The general principle of the machine is similar to the "Gratte" in use in Mauritius, and the "Raspador" of Yucatan. The leaves, as in these machines, are presented endwise, and are cleaned by the beaters attached to the drum. About one half of each leaf is cleaned at one time. It is necessary to change the position of the leaf before the other half can be cleaned. There is, however, no reverse action, and in this respect the Weicher machine possesses an advantage over other machines of the same type.

The Feed Table.—The feed table consists of an endless band composed of flat iron laths fastened across two iron chains. The band is fitted with iron clamps for holding the leaves in position and presenting them to the beaters in such a position that at first about one half of their length is cleaned. After this the leaf is carried continuously back on the underside of the band, and brought out so that it can be seized by the operator and its position changed. When it is next presented to the beaters, the uncleaned part is treated and the whole of the fibre is then carried out and removed from the machine. The feed table is therefore automatic, and it will carry at one time about four or five leaves. These may be any length up to about eight feet, and the quickness of the cleaning depends very much upon the activity and aptness of the operators.

Serving the Machine.—For regular working a man and two boys are required. The man and one boy attend to the feeding and the changing of the leaves, while the other boy takes out the cleaned fibre and hangs it up to dry.

The Trial.—The machine was worked recently at intervals for about an hour. It readily cleaned Agave leaves of various sizes, some only half an inch thick and others between two and three inches thick. There is an arrangement of levers to allow for yielding in case of very thick leaves, and the machine was not clogged or stopped during any portion of the trial. This is an important consideration. The quality of the fibre produced was on the whole good. There was but little waste, and none of the strands was damaged or broken. The samples cleaned are now at Kew. Nothing has been done to them since they left the machine.

Washing the Fibre.—Where there is an abundant supply of fresh water, an arrangement could be made whereby the fibre might be washed while passing under the beaters. This, however, is not an essential part of the cleaning. It may be adopted or not according to local circumstances.

Particulars of the Machine.—The following particulars were obtained from Mr. Weicher. The total weight is 3,100 pounds (avoirdupois). The space occupied by the machine with feed table extended is 14½ feet long by 2½ feet wide. The power required is 10-horse

power giving 500 revolutions per minute. The inventor has worked the machine in Yucatan for a period extending over nearly three months. One machine is still in Yucatan.

Yield of Fibre.—Mr. Weicher claims it will treat 10 to 12 tons of green leaves in a day of 10 hours. Allowing the leaves to yield 3 per cent. of fibre (in a prepared dry condition), this would be at the rate of 672 pounds per day as the lowest return, with a possible return (at 4 per cent.) of 896 pounds per day. As far as could be judged from the recent trial these returns are not improbable. It is, however, impossible to offer a definite opinion on the subject. The actual capacity of the machine can only be determined by continuous working on a Sisal hemp plantation, and with operators who have become thoroughly accustomed to it. In a Report on the Sisal hemp industry of Yucatan, prepared for the Government of the Bahamas by Captain E. Jerome Stuart, [*Kew Bulletin*, 1892, p. 275], it is stated that the Weicher machine "requires 12 horse-power engine and the services of "three men. Capacity, 2,500 lbs. dry fibre per day of 10 hours." Mr. Weicher judiciously disclaims all responsibility for the capacity here given. He prefers to indicate it by saying that the machine will treat at the rate of 10 to 12 tons of green leaves per day. The actual yield in dry fibre will therefore depend upon the quality of the leaves. Mr. Weicher hopes to obtain as high as 5 per cent. of dry fibre from good leaves, and he thus estimates the out-turn per day of 10 hours at 1,120 to 1,340 lbs. These figures, it is needless to add, are given entirely on his authority. For comparison from actual working it may be mentioned that the Yucatan Raspador (with two men) acting on leaves of Sisal hemp will clean about 400 pounds of dry fibre per day. On the other hand, the Mauritius machine (also with two men) acting on leaves of the Green Aloe (*Furcræa gigantea*) will turn out only about 214 pounds of dry fibre per day. The difference in these returns may be due to the different qualities of the leaves, but it is evident that, so far, neither of these machines working on a commercial scale is able to turn out more than 400 pounds of dry fibre per day.

The conjectural figures given by Mr. Weicher require therefore to be received with due reserve until the performances of the machine have been fully tested.

Summary.—I may add that I have seen most fibre machines that have been brought forward and tested during the last 12 years. I am not yet in a position to say that any machine has fulfilled all the conditions necessary in cleaning Sisal hemp fibre. The whole of the Mauritius hemp (from *Furcræa gigantea*) exported from that island is cleaned by the Gratte, locally made and costing about 30*l.* [*Kew Bulletin*, 1890, p. 98]. This has to be fed with one or two leaves at a time, and there is considerable waste. There is also some risk to the workpeople, who have to hold the leaves in their hands while they are being cleaned. The Yucatan fibre is chiefly, if not entirely, cleaned by the rough contrivance known as the Raspador, also locally made [*Kew Bulletin*, 1892, p. 37, with woodcut]. The working of this is slow and wasteful, but with very cheap labour the industry is apparently very remunerative when prices are high. There is probably little or no inducement, owing to cheap labour, to introduce improvements in fibre cleaning in Yucatan. In the Bahamas the circumstances are entirely different, and a satisfactory machine is indispensable. The various machines that have hitherto sought to supplant the Gratte and Raspador, such as the "Death machine," the "Barraclough machine," and others, have all turned out better qualities

of fibre, it is true, but the total yield has been small and disappointing. In fact, taking into account the great efforts made to introduce and popularise these machines, their extended use on a commercial scale has made little or no progress of late years. The Weicher machine possesses distinct merit, and it is more promising than any (so far as I have observed) with an automatic feed table. It may be said against it that it is somewhat heavy and intricate, and its price (not yet fixed) must be higher than either the Gratte or Raspador. It deserves, however, to be tried under suitable circumstances, and those interested in the fibre industry of the Bahamas, for instance, cannot do better than carefully test it on the spot. The inventor would then have an opportunity of showing its capabilities in the presence of an unlimited supply of leaves. It is impossible to do more in this country than form an approximate idea of its merits. It may be added that it is claimed for the machine that it will clean the leaves of Bow-string hemp (*Sansevieria*), Banana (*Musa sapientum*), and possibly also pine-apple and Ramie. None of these, unfortunately, were available at the recent trial.

D. M.

CCCXIV.—MISCELLANEOUS NOTES.

Retirement of Dr. Cooke.—On the removal of the Economico-botanical collections of the India Museum to Kew in 1880, the services of Dr. Cooke, who had hitherto had charge of them, were also transferred. As stated in the Kew Report for that year (p. 62) he took charge of the collections of Thallophytes in the Herbarium of the Royal Gardens. Dr. Cooke, after the death of the Rev. M. J. Berkeley, was the leading authority in Mycology in the country. The Kew collections of Fungi were already probably the largest in existence; to those were added, by purchase, the private herbarium of Dr. Cooke himself. Besides incorporating the considerable accumulations, he re-arranged and brought the whole into excellent order. Having reached the age of 65, Dr. Cooke retired at the close of last year from the public service. In consideration of his services at Kew, the Secretary of State for India in Council was pleased to make a small addition to his pension. Dr. Cooke's services to the study of Mycology in this country hardly need a record. They are sufficiently evidenced by his "Handbook of the British Fungi" (1871), his "Illustrations of British Fungi," 8 vols., and by "Grevillea," a quarterly record of Cryptogamic Botany, of which 20 volumes (1873–92) have been published under Dr. Cooke's editorship.

Principal Assistant (Cryptogams).—The vacancy created by Dr. Cooke's retirement, has been filled by the appointment, in May of the present year, of Mr. G. Massee, with a somewhat larger scope of duties. In 1871–73 Mr. Massee travelled in South America under the advice of the well-known botanical traveller, Spruce, who was for many years employed by the Government of India in the task of obtaining seeds and plants of *Cinchona*. Under Spruce's influence, Mr. Massee has devoted himself ever since to botanical studies and investigations, and has now become an acknowledged authority in Cryptogamic Botany. He has published many works and papers connected with fungology. Amongst these may be mentioned:—A Monograph of the *Thelephoreæ*, published

in the Journal of the Linnean Society; a Monograph of the *Gastromycetes* in the "Annals of Botany"; a monograph of the *Myxogastres*; and "British Fungus-Flora" (two volumes have appeared).

Acidanthera æquinoctialis, *Baker*.—Through Mr. Scott Elliot, Kew has received full specimens, with corms for cultivation, of this plant collected on the top of Sugar-loaf mountain, Sierra Leone, where Mr. Scott Elliot found it on his recent expedition as botanist to the Anglo-French Delimitation Commission. It was only known previously by a sketch of the inflorescence and flowers made by Dean Herbert, now in the Lindley Library, a copy of which was made several years ago by Mrs. Thiselton Dyer for the Kew collection of drawings. The corm is large and globose, with tunics of parallel fibres. The plant reaches a height of 4 feet, and the stem bears a large number of strongly-veined ensiform leaves, the lowest of which is a foot and a half long, and nearly an inch broad. The tube of the perianth is 5 or 6 inches long, the longest that is known in the whole order *Irideæ*. The species much resembles the Abyssinian *A. unicolor* and *A. bicolor* of Hochstetter, but is much larger in size. The locality where the plant was seen by Mr. Scott Elliot is 3,000 feet above sea-level. The whole collection brought home contains altogether 1,500 species.

Celtis australis.—The Earl of Ducie, F.R.S., has recently presented to the Museum some samples of whip-handles made of the wood of the European nettle tree, the *micocoulier* of the French (*Celtis australis*, L.). This tree is closely allied to the common elms, and is distinguished from them by having, instead of a membranous fruit, a hard fleshy drupe like a small cherry. The wood, when fully grown, is very hard and even grained, and is used for furniture. The branches are elastic and supple, and adapted for making hay forks and whip-handles. The specimens now presented to the Museum are peculiarly twisted. By cutting the branches along their length into four strips, and twisting these in the form of a cable, the strength and elasticity of the handle are increased. These whip-handles are generally used in France, and as they are chiefly made at Perpignan, they pass under the name of *Perpignans*.

Malayan Plants.—Dr. G. King, F.R.S., has sent from Calcutta a collection of between two and three hundred new or rare Malayan plants, and a set of two hundred and seventy specimens of the late Father Scortechini's Perak ferns. These ferns were worked out by Colonel Beddome, and published in the *Journal of Botany* in 1887. Mr. Charles Curtis, Assistant Superintendent, Forest Department, Penang, who is an excellent collector, has also forwarded a further set of 220 species of Malayan plants.

Karakoram Expedition.—Mr. W. M. Conway has presented the dried plants collected on his recent expedition to the Karakoram glaciers, in the Western Himalayas. They will shortly be worked out.

Persia.—Dr. Stapf, assistant for India in the Herbarium, has presented type specimens of about seventy species of plants collected by Buhse in Central and Northern Persia, and described by Boissier and Buhse.

Asia Minor.—A collection of three hundred species made by Sintenis in the district of Kastamuni, or Castambul, Asia Minor, has been purchased for the Herbarium.

Japan.—Through Dr. Kingo Miyabe, Kew has received from the Agricultural College of Sapporo, Japan, the first part of a set of the plants of the Island of Yeso. It contains 237 species, and includes the orders *Ranunculaceæ* to *Rosaceæ*. And through Professor Matsumura Jinzo, Director of the Botanic Garden, Imperial University, Tokio, the Herbarium has been enriched by a collection of some 1,350 species, including many not previously represented at Kew. This collection is valuable, apart from its numerical extent, inasmuch as it contains authentic specimens of novelties published by Professor M. Jinzo himself.

Tropical Africa.—From the expedition undertaken by Sir Gilbert Carter, K.C.M.G., Governor of Lagos, into the interior of that Colony and Protectorate, Kew has received two consignments of dried plants gathered by Dr. Rowland, the medical officer to the expedition. In all there are about 400 species, in excellent condition, and many of them of great interest. Mr. Millen, the Curator of the Botanical Station at Lagos, has also sent a small collection. Further Lieut. Charles S. Smith, R.N., Consul at Zanzibar, engaged on the Anglo-German Demarcation Commission, has forwarded a parcel of about 50 species, chiefly from Kilimanjaro.

South Africa.—From South Africa the Herbarium has received the twelfth and fourteenth centuries of Bolus and MacOwan's "Herbarium Normale Austro-Africanum," and Mr. Medley Wood, of Natal, has presented a number of novelties, including a very remarkable new *Sterculia*, which will be figured in the *Icones Plantarum*.

America.—Kew has purchased a set of Mr. C. G. Pringle's Mexican Plants, collected in 1892, and also the first three centuries of Mr. L. D. Reed's Virginian plants. Both of these gentlemen are excellent collectors, and Mr. Pringle's Mexican plants include novelties from the apparently inexhaustible Mexican flora. Dr. A. Engler, the Director of the Berlin Botanic Garden, has presented a parcel of about 100 species of Brazilian *Melastomaceæ*, many of them authenticated types of new species.

Australasia.—From time to time Sir F. von Mueller, K.C.M.G., has forwarded specimens of various novelties described by himself, including a number from New Guinea. Mr. W. Colenso, F.R.S., has presented specimens of about 200 New Zealand cellular cryptogams; and Mr. D. Petrie, F.L.S., a small but very interesting collection of flowering plants from the same country, several of them new species discovered and described by the donor.

Margaret Meen's "Exotic Plants from the Royal Gardens, Kew."—During many years it has been sought to add to the Kew Library a copy of this book, not so much on account of its scientific value as the fact of its being a record of plants that flowered at Kew towards the end of the last century. It is only within the last few weeks, however, that the work has been secured. It is a large folio, dedicated to Queen Charlotte. Like many other ambitious projects it soon collapsed. The intention was to publish two numbers annually, each containing four plates; and the price was sixteen shillings each for the coloured and twelve for the uncoloured. The first part is dated 1790, and contains figures of *Strelitzia Reginæ*, *Plumbago rosea*, *Cypripedium album*, and *Solandra grandiflora*. They are all lettered "M. Meen pinxt." and two of them "Prestel sculpt." and dated 1790. Number 2 has also a printed title page, but the plates in the Kew copy are proofs before lettering, and are probably by a different artist. *Ixora coccinea*, *Erica grandiflora*, *Lobelia surinamensis* and *Fuchsia coccinea* (true) are the plants represented. So far as our researches go these two numbers were all that was published, if indeed the second was really published; for Pritzel records only one, and he gives the dimensions as 19 by 15 inches; whereas the copy at Kew is 24½ by 19 inches. Bound with the foregoing in a cardboard cover, is a fine coloured plate of *Hæmanthus multiflorus*, "from Sierra Leone, recovered to European gardens "after having been lost near two centuries." "Drawn and engraved by "F. P. Nodder, Botanic Painter to Her Majesty, and published by him, May 1st, 1795." Nodder was the artist and publisher of an octavo work of four thin volumes, entitled "Flora Rustica," which appeared between 1792 and 1795. It contains 144 plates, and the descriptive letterpress was written by Thomas Martyn, then Professor of Botany at Cambridge.

Bulbs from Asia Minor.—Mr. E. Whittall, a merchant of Smyrna, and an ardent lover of plants, has considerably enriched the Kew collection of bulbous plants. He is collecting systematically, and the results promise to be very successful. Already several new things contributed to the herbarium have come to light amongst them *Galanthus Icarisiæ*, *Tulipa concinna*, and *Fritillaria Whittallii*.

Botanic Gardens, Brisbane.—The disastrous floods that took place in Queensland in February last appear to have inflicted great injury to the Botanic Gardens at Brisbane. These gardens adjoin Government House and indeed form a part of the same domain occupying a peninsula projecting into the Brisbane River. They were recently described in the *Australian Handbook* "as laid out with great taste; they abound "with tropical and sub-tropical trees and shrubs, and may be considered "one of the principal 'lions' of Brisbane." The untoward results of the late floods may be gathered from an extract from a letter received from Mr. Philip MacMahon, the Curator of the Gardens, dated the 28th March 1893:—You will regret to learn that these gardens were partially destroyed by two floods which followed each other at an interval of a fortnight on the 5th and 19th ult. A large new residence recently built for me was utterly destroyed, and all my books, &c., completely swept away. The gardens over a large portion of their area were covered by a deposit of mud and sand, in some cases two feet deep, and many thousands of shrubs were destroyed; many trees have sustained, I fear, permanent injury. All seeds and specimens as well as all my office

records having been destroyed, it will be a great help to me in the reconstruction of the gardens if you could send me any seeds of plants not indigenous to these colonies. I am specially anxious to secure Chinese and Japanese shrubs, and flowering trees from any parts of the world.

New Liliaceæ from Tropical Africa.—In Engler's *Jahrbücher*, vol. XV., pp. 467–479, is a paper by Dr. Engler and Mr. J. G. Baker on the new Liliaceæ discovered by recent German collectors in Tropical Africa. It includes an *Iphigenia*, a *Bulbine* with flat leaves, an *Anthericum* of the sub-genus *Phalangium*, five species of *Chlorophytum*, one *Eriospermum* an *Aloe*, four *Albucæ*, one *Urginea*, two *Drimiæ*, five *Scillæ* of the sub-genus *Ledebouria*, and six new *Dracænæ*, one of which is figured. This latter, which is named *D. Braunii* after its discoverer, has been brought from the Cameroons to the Berlin Botanic Garden, where it flowered in August 1891. It has very short flowering stems, with only a single pair of leaves, overtopped by the much longer leafy sterile stems. The new *Aloe* (*A. venenosa*, Engler) was found by Dr. Pogge on the Kassai, one of the feeders of the Congo in the very centre of the continent, and is used as an arrow poison.

Botanical Station, Dominica: — The following interesting particulars respecting the work carried on at the Botanical Station, Dominica (in the Leeward Islands), have been communicated to Kew by Mr. Joseph Jones, the Curator:—Our work is prospering in this island. Everything is done to make the Station as attractive as possible, and on Sundays and holidays we have a large number of visitors. That it is useful to the planters is shown by the number of plants sent out during the past year, which reached the number of 16,486. I am acquainted with all the leading planters of the island and frequently forward information by letter. Owing to pressure of work on the station I have not been able to visit all those who have wished me to do so, as Dominica is a large island, in some parts almost inaccessible, and to visit those in the north means a somewhat lengthy absence from the station. The planters here are favourable to the station and consider the progress made very satisfactory, on the allowance of money. Some advocate an increase of the grant that it may be brought up to a high state of efficiency in a short time. There is no doubt our work is prospering and will continue to prosper. At the present time I am very busy. A small grant of money has been made to lay out the Recreation Ground and make it suitable for cricket. This I am carrying out as quickly as possible. To level and fill up the depressions requires about 500 tons of earth and the work will extend over two months. I am also called upon to lay out the grounds at the new Quarantine station and furnish the ornamental plants required. I have also to superintend the public gardens in town, the Government House grounds and furnish what plants are required at Government House. The nurseries have been recently enlarged by the addition of two new sheds. I have a large quantity of Blue Mountain, Mocha, and Liberian coffee for sale, also a good stock of cloves, and am trying to work up a large stock of nutmegs. Of peppers, black, cubeb, and long I have a fair stock, and am trying to push them. Of cacao we have a good stock in bamboo pots. Colas also meet with a ready sale.